

# **Supplemental Sampling Work Plan For Soil/Sediment Sampling and Groundwater Data Collection**

**Operable Unit 2, McIntosh, Alabama**

**Prepared for:**



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Project 6107-12-0036**

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## **ABBREVIATIONS AND ACRONYMS**

AOC	Administrative Order of Consent
Basin	Olin Basin
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
DDTR	2,4'- and 4,4'- isomers of DDT, DDE, and DDD
DQO	Data Quality Objective
FS	Feasibility Study
HCB	Hexachlorobenzene
MACTEC	MACTEC Engineering and Consulting, Inc.
Olin	Olin Corporation
OU-1	Operable Unit 1
OU-2	Operable Unit 2
RI	Remedial Investigation
Site	McIntosh Plant Site
USEPA	U.S. Environmental Protection Agency

## **1.0 BACKGROUND**

Olin Corporation (Olin) has completed a Remedial Investigation (RI) for Operable Unit (OU)-2 at its McIntosh, Washington County, Alabama Plant with the approval of the U.S. Environmental Protection Agency (USEPA). Olin is in the process of finalizing the OU-2 Feasibility Study (FS) under the oversight of USEPA. The FS Revision 1 was submitted to EPA on April 9, 2012.

The Plant is an active chemical production facility, located approximately 1 mile east-southeast of the town of McIntosh, Alabama. OU-2 is listed on the National Priorities List of the Comprehensive Environmental Response, Compensation, and Liability Act. Olin signed an Administrative Order of Consent (AOC), effective May 9, 1990, to satisfy the National Contingency Plan (40 Code of Federal Regulations 300). OU-2 comprises the Olin Basin (Basin), Round Pond, surrounding wetlands on the Olin property, and the wastewater ditch and former discharge ditch that discharged to the Basin from 1952 to 1974 (Figure 1-1).

Data quality objectives (DQOs) for supplemental soil and sediment sampling and groundwater elevation measurements were developed to reduce uncertainties for the FS, baseline monitoring for remedial action, long-term monitoring, and monitoring during remedy implementation (Appendix A). These DQOs were discussed and revised in a meeting with EPA on January 17-18, 2012 and were submitted to EPA on February 29, 2012. These DQOs address the soil sampling and groundwater data collection presented herein.

### **1.1 PURPOSE AND OBJECTIVE**

The purpose of this work plan is to provide guidance for supplemental data collection at OU-2 to address the following subordinate questions presented in the DQOs.

- What are the current mercury and hexachlorobeneze (HCB) concentrations of sediment in the wastewater and former discharge ditch?
- Is water in the wastewater ditch in OU-2 interconnected with groundwater?
- What are the current concentrations of the 2,4'- and 4,4'-isomers of dichlorodiphenyltrichloroethane (DDT), dichlorodiphenyldichloroethylene (DDE), and dichlorodiphenyldichloroethane (DDD) (collectively, DDTR) in floodplain surface soil northwest of the Basin and southwest of Round Pond?

The subordinate questions regarding potential groundwater upwelling and the Kd values of sediments and cap materials presented in Appendix A will be addressed separately from this work plan.

## 2.0 SAMPLING METHODS

This work plan describes the data collection and analysis to be conducted at OU-2 to assess the

- Mercury and HCB concentrations in the wastewater and former discharge ditch,
- Hydraulic relationship between the wastewater ditch and groundwater, and
- DDTR concentrations in the floodplain soils northwest of the Basin and west of Round Pond.

Equipment decontamination, sample handling, laboratory quality assurance/quality control procedures, and data validation methods will be conducted in accordance with the project *Health and Safety Plan* (MACTEC Engineering and Consulting, Inc. [MACTEC], 2008a) and the project *Quality Assurance Project Plan* (MACTEC, 2008b).

### 2.1 WASTEWATER AND FORMER DISCHARGE DITCH SAMPLING

Mercury and HCB concentrations in the wastewater and former discharge ditches were collected in 1991, with additional sampling in 2001. Surficial sediment sampling will be conducted to evaluate the current mercury and HCB concentrations in sediment in the wastewater and former discharge ditch. A topographic survey will also be conducted. This topographic survey will include channel width and depth along the lengths of the ditches, surface water and sediment bed elevation, and wetted width of the channel.

#### 2.1.1 Sediment Sampling

A site reconnaissance was conducted on March 14, 2012 to document the accessibility, erosional/depositional areas, and field conditions of the wastewater ditch and former discharge ditch. These reconnaissance observations and the historic concentrations of mercury and HCB (Figure 2-1) were considered in selecting the recommended sediment sample locations.

Surficial (upper 0-4 inches) sediment samples will be collected in the wastewater ditch and former discharge ditch at 14 recommended locations (Figure 2-1). Several factors were considered in sample location selection. These factors include the surficial and at-depth historical mercury and HCB concentrations in the ditches, the sinuosity of the ditches, and accessibility. Straight sections of the ditch with similar historical concentrations have fewer recommended sample locations compared to sections with bends. Sampling locations are spaced more closely together in bends because of the potential for

sediment transport and deposition. These locations may be modified in the field based on site conditions at the time of sampling.

Samples will be collected using a petit Ponar, Eckman dredge, or similar method. The sample location coordinates will also be collected at the time of sample collection. Sediments will also be probed to evaluate sediment depths at each location. The samples and analytical methods are presented in Table 2-1.

### **2.1.2 Topographic Survey and Groundwater Level Measurement**

The topographic survey will be conducted by a registered land surveyor to measure the elevation of the ditches. The survey will generate 1-foot contours. Groundwater levels will be measured from monitoring wells at BA-MW1A/B/C, BA-MW2B/C through BA-MW8B/C, piezometers BA-PZ1A/B/C, BA-PZ2A/B/C, BA-PZ3B/C, and BA-PZ4B/C, and monitoring wells E4, E5, PH3D, PE5, and PL10S/D (Figures 2-1 and 2-2) using a water level indicator during the same field event as the topographic survey. The Basin water level will also be recorded on the day of the survey.

## **2.2 FLOODPLAIN SOIL SAMPLING**

BASF (formerly Ciba-Geigy) submitted the *2010 Monitoring, Inspection, and Maintenance Report: Additional Remediation, Operable Unit 3* (LimnoTech, 2010) to USEPA. DDTR concentration mapping in the floodplain soils northwest of the Basin and southwest of Round Pond depicted concentrations of 30 to 50 parts per million. These contours are based on historical concentrations collected in the 1990s (Figure 2-3). Reduction in DDTR concentrations have been documented in other areas since the 1900s possibly as a result of remedial action at the BASF site and natural attenuation. Floodplain soil sampling will be conducted in this area to evaluate the current concentrations of DDTR in floodplain surface soil (0-2 inches) northwest of the Basin and west of Round Pond. Surficial floodplain soil sampling will be conducted at these locations (Figure 2-3). The sample location coordinates will be surveyed at the time of sample collection. The samples and analytical methods are presented in Table 2-2.

## **2.3 GROUNDWATER DATA COLLECTION**

Groundwater levels will be measured from monitoring wells and piezometers located around the Basin (Figure 2-2) using a water level indicator during one flood and one non-flood conditions (two events). The groundwater level measurements collected during sampling of the wastewater ditch and former discharge ditch will serve as the non-flood condition event. The wells located on the berm will not be measured during flood conditions because they will be under water. Monitoring wells and piezometers

along the bluff will be measured during flood conditions. The Basin water elevation at the gate will be recorded during the groundwater level measuring events.

The bluff will be walked during the non-flood condition event to look for potential seeps. GPS locations will be recorded if seeps are located.

### **3.0 REPORTING AND SCHEDULE**

A Supplemental Data Collection Report will be prepared to summarize the results of these activities. Olin requests USEPA review and approval of this work plan prior to July 23, 2012 so that sampling can commence in late July 2012 to avoid flood conditions.

## **4.0 REFERENCES**

LimnoTech, 2010. 2010 Monitoring, Inspection, and Maintenance Report: Additional Remediation Operable Unit 3 (OU3). Prepared for BASF McIntosh, Alabama. December.

MACTEC, 2008a. Health and Safety Plan/Contingency Plan for the Enhanced Sedimentation Pilot Project. Revision 2. Operable Unit 2, McIntosh, Alabama. September 16.

MACTEC, 2008b. Quality Assurance Project Plan. Operable Unit 2, McIntosh, Alabama. October 9.

## **TABLES**

**TABLE 2-1**  
**2012 Wastewater Ditch and Former Discharge Ditch Sediment Samples and Analyses**  
Olin McIntosh OU-2

Samples	Analyses			
	Total Mercury - EPA 7471	Total Organic Carbon - EPA 9060M	Percent Moisture - ASTM D2216	HCB - EPA 3550B / 8270C
<b>Wastewater Ditch</b>				
OU2W-SED-OD25-YY	X	X	X	X
OU2W-SED-OD20-YY	X	X	X	X
OU2W-SED-OD18-YY	X	X	X	X
OU2W-SED-OD15-YY	X	X	X	X
OU2W-SED-OD13-YY	X	X	X	X
OU2W-SED-OD12-YY	X	X	X	X
OU2W-SED-OD11-YY	X	X	X	X
OU2W-SED-OD10-YY	X	X	X	X
OU2W-SED-OD08-YY	X	X	X	X
OU2W-SED-OD06-YY	X	X	X	X
OU2W-SED-OD04-YY	X	X	X	X
OU2W-SED-OD01-YY	X	X	X	X
<b>Former Discharge Ditch</b>				
OU2D-SED-BD05-YY	X	X	X	X
OU2D-SED-BD03-YY	X	X	X	X

**Notes:**

ASTM - American Standard Test Method

EPA - Environmental Protection Agency

HCB - hexachlorobenzene

OU2D-SED - Sediment sample from the OU-2 former discharge ditch

OU2W-SED - Sediment sample from the OU-2 wastewater ditch

YY - 2-digit year

Prepared by: RRP 6/11/12

Checked by: HEF 6/11/12

**TABLE 2-2**  
**2012 Floodplain Soil Samples and Analyses**  
Olin McIntosh OU-2

Samples	Analyses		
	DDTR - EPA 3550B / 8081A	Total Organic Carbon - EPA 9060M	Percent Moisture - ASTM D2216
OU2B -FPSS16-YY	X	X	X
OU2B -FPSS17-YY	X	X	X
OU2B -FPSS18-YY	X	X	X
OU2B -FPSS19-YY	X	X	X
OU2B -FPSS20-YY	X	X	X
OU2B -FPSS21-YY	X	X	X
OU2B -FPSS22-YY	X	X	X
OU2B -FPSS23-YY	X	X	X

**Notes:**

ASTM - American Standard Test Method

DDTR - 2,4'- and 4,4' -isomers of DDT, DDE, and DDD

DDD - dichlorodiphenyldichloroethane

DDE - dichlorodiphenyldichloroethylene

DDT - dichlorodiphenyltrichloroethane

EPA - Environmental Protection Agency

FPSS - Floodplain Surficial Soil Sample

OU2B - OU-2 Basin

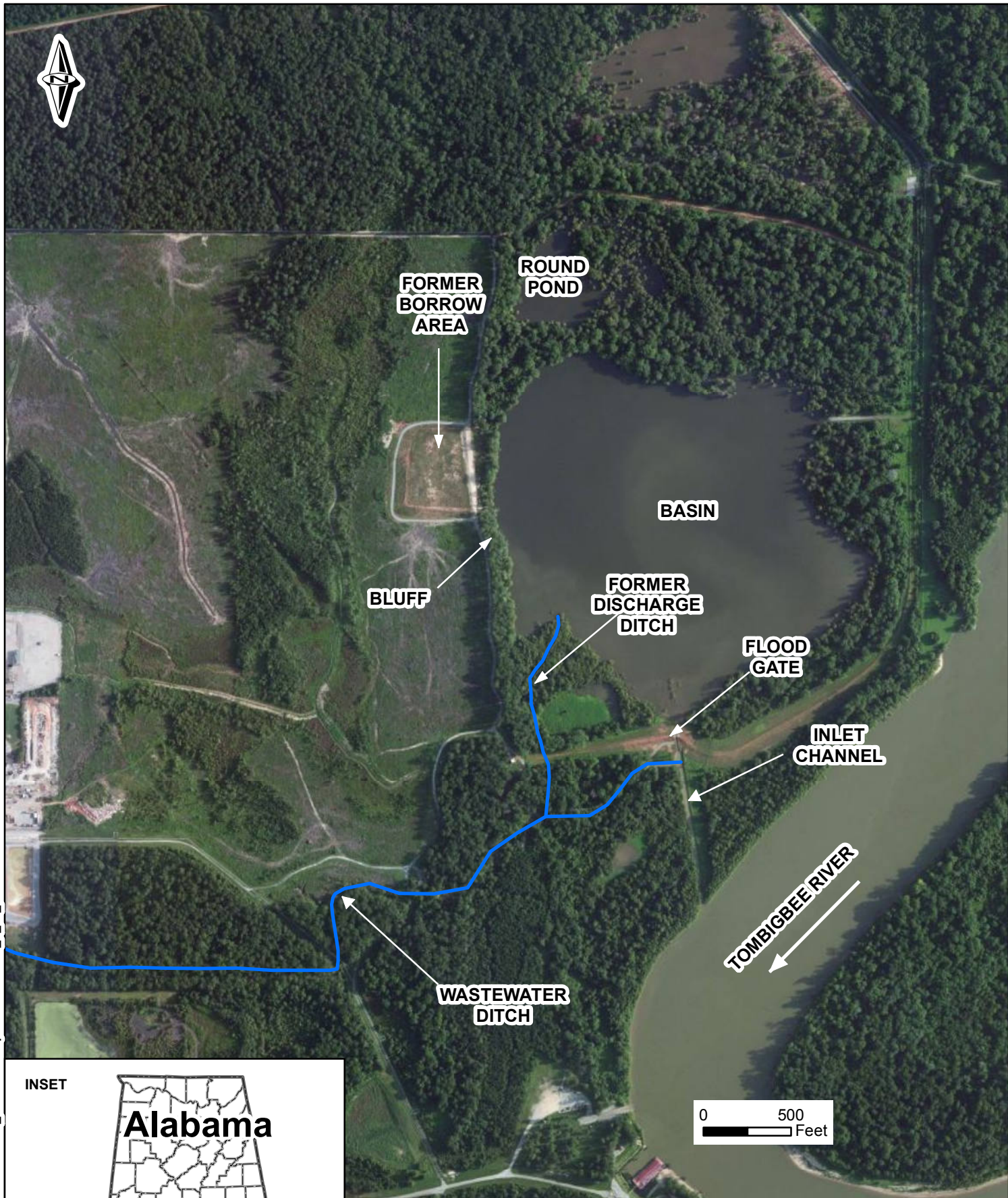
YY - 2-digit year

Prepared by: RRP 5/29/12

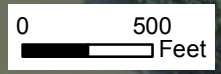
Checked by: HEF 5/30/12

## **FIGURES**


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INSET



Source: ESRI/BING Imagery

Olin McIntosh OU-2		
Site Location		
Prepared by/Date: THP - 6/7/12		Figure Number: 1-1
Checked by/Date: CED - 6/7/12		
Project Number: 6107120036		

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Legend

- Monitoring Well
- Recommended Surficial Sediment Sampling Location
- Approximate 6' Water Elevation

HCB Wastewater Ditch Sample Locations and Concentration

- 0 - 8 mg/Kg
- 9 - 360 mg/Kg
- 361 - 720 mg/Kg
- 721 - 1080 mg/Kg
- 1081 - 1400 mg/Kg

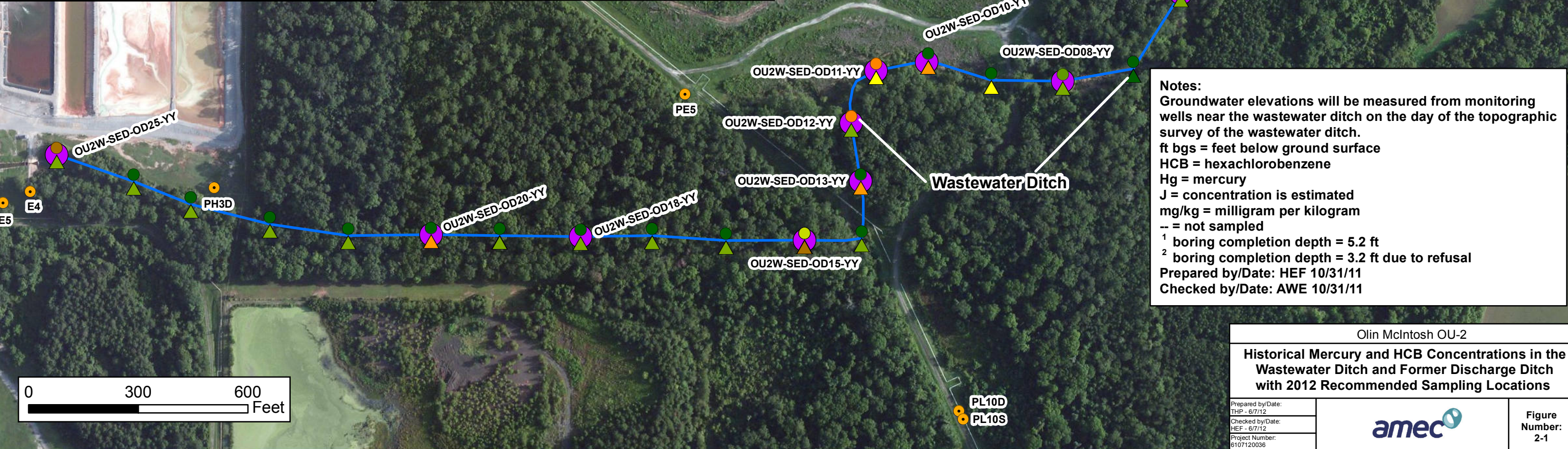
Mercury Ditch Sample Locations and Concentration

- 0.00 - 1.00 mg/Kg
- 1.01 - 3.60 mg/Kg
- 3.61 - 6.20 mg/Kg
- 6.21 - 8.80 mg/Kg
- 8.81 - 12.60 mg/Kg
- 12.61 - 115.00 mg/Kg

Mercury and HCB sample locations are collocated. They are offset in the map for clarity.

Wastewater Ditch Core Mercury Results (1991-92)			
	C3 (BD02) <sup>1</sup>	OD15	OD25 <sup>2</sup>
Depth (ft bgs)	Hg (mg/kg)	Hg (mg/kg)	Hg (mg/kg)
0-1	1.8	4.9	213
1-2	26.8	--	52.2
2-3	44.6	167	3.5
3-4	12.2	--	--
4-5	<0.15	337	--
5-6	--	--	--
6-7	--	0.19	--
7-8	--	0.4	--
8-9	--	0.31	--
9-10	--	<0.12	--
10-11	--	<0.13	--

Wastewater Ditch Core HCB Results (1991-92)			
	C3 (BD02) <sup>1</sup>	OD15	OD25 <sup>2</sup>
Depth (ft bgs)	HCB (mg/kg)	HCB (mg/kg)	HCB (mg/kg)
0-1	<1	480	51 J
1-2	2.8	--	45 J
2-3	<1	130 J	2.3
3-4	<0.57	--	--
4-5	7.8	560	--
5-6	--	--	--
6-7	--	<0.5	--
7-8	--	<0.5	--
8-9	--	<0.5	--
9-10	--	<0.5	--
10-11	--	<0.5	--



Notes:  
Groundwater elevations will be measured from monitoring wells near the wastewater ditch on the day of the topographic survey of the wastewater ditch.  
ft bgs = feet below ground surface  
HCB = hexachlorobenzene  
Hg = mercury  
J = concentration is estimated  
mg/kg = milligram per kilogram  
-- = not sampled  
<sup>1</sup> boring completion depth = 5.2 ft  
<sup>2</sup> boring completion depth = 3.2 ft due to refusal  
Prepared by/Date: HEF 10/31/11  
Checked by/Date: AWE 10/31/11

Olin McIntosh OU-2  
Historical Mercury and HCB Concentrations in the  
Wastewater Ditch and Former Discharge Ditch  
with 2012 Recommended Sampling Locations

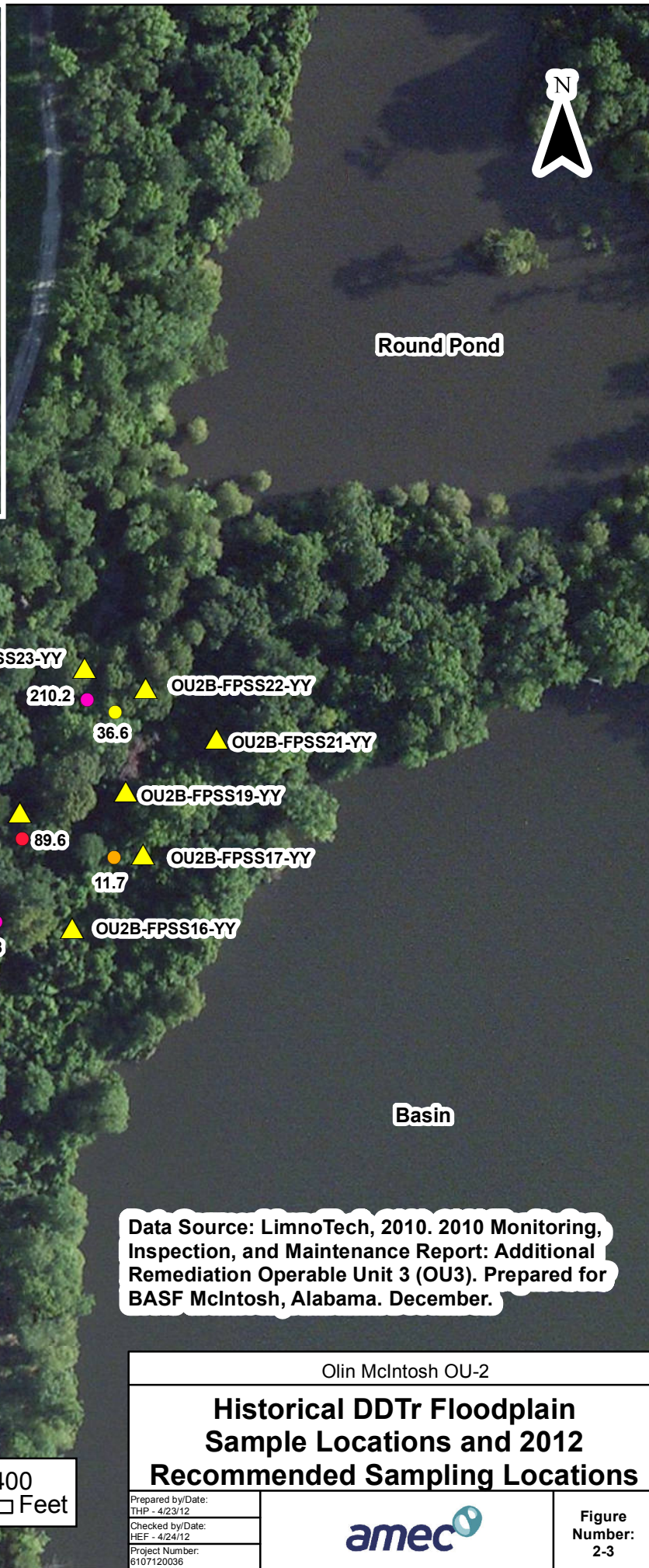
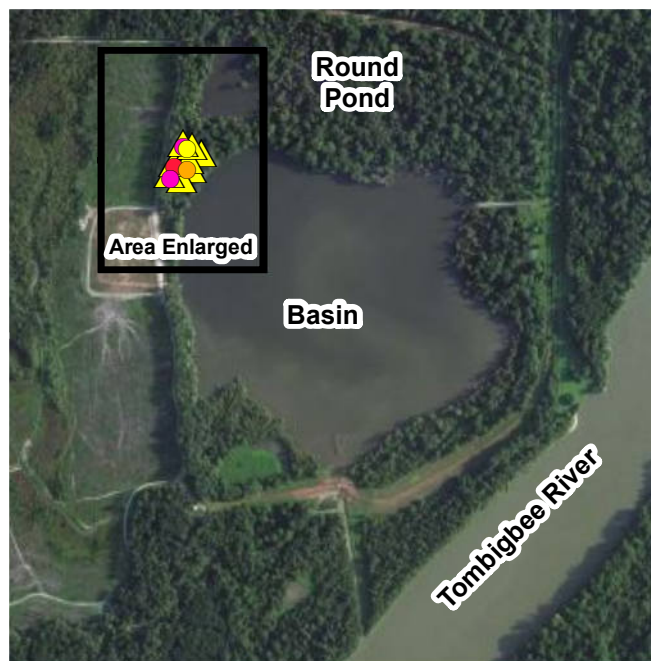
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Project Number:  
6107120036



Figure  
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2-1

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0 200 400 Feet

Olin McIntosh OU-2	
<b>Historical DDTr Floodplain Sample Locations and 2012 Recommended Sampling Locations</b>	
Prepared by/Date: THP - 4/23/12 Checked by/Date: HEF - 4/24/12 Project Number: 6107120036	

**APPENDIX A**  
**DATA QUALITY OBJECTIVES**

**DATA QUALITY OBJECTIVES  
SUPPLEMENTAL SAMPLING  
Olin McIntosh OU-2  
AMEC Project 6107-12-0036  
Meeting Dates: January 17-18, 2012**

<b>Decision/Question: Reduction of Uncertainty for the Feasibility Study/Remedial Design. Is Remedial Action Required?</b>			
<b>Subordinate Questions</b>	<b>Data Inputs</b>	<b>Boundaries</b>	<b>Decision Rule</b>
<u>Wastewater and Former Discharge Ditches</u>			
What are the current constituent concentrations of sediment in the wastewater and former discharge ditch?	<ul style="list-style-type: none"> <li>• Approximately 15 surficial sediment samples (0-6 inches) collected from wastewater ditch and former discharge ditch</li> <li>• Locations established based on likely erosional/depositional areas and historic concentrations</li> <li>• Analyses for HCB, TOC, percent moisture at each location</li> <li>• Analysis for THg at select locations</li> <li>• Probing conducted for sediment depths</li> <li>• Coordinates of sample locations</li> </ul>	<ul style="list-style-type: none"> <li>• Wastewater Ditch – length of ditch from outfall to confluence with intake channel; bank to bank</li> <li>• Former Discharge Ditch – length of ditch from origin to confluence with Basin; bank to bank</li> </ul>	<ul style="list-style-type: none"> <li>• If surficial sediment concentrations are less than PRGs, no further action required.</li> <li>• If concentrations exceed PRGs, define extent. Remedial actions for ditch sediments, if needed, will be evaluated during the Remedial Design</li> </ul>
Is water in the wastewater ditch in OU-2 interconnected with groundwater?	<ul style="list-style-type: none"> <li>• Topographic survey of wastewater ditch and water elevation</li> <li>• Groundwater elevations collection from nearby monitoring wells/ piezometers at time of survey</li> </ul>	Wastewater Ditch – length of ditch from outfall to confluence with intake channel; bank to bank	<ul style="list-style-type: none"> <li>• Evaluate information to assess potential groundwater connection with wastewater ditch</li> </ul>
<u>Floodplain Soils in the Northwest Portion of OU-2</u>			
What are the current concentrations of DDTR in floodplain surface soils northwest of the Basin and west of Round Pond?	<ul style="list-style-type: none"> <li>• Approximately 8-10 sample locations</li> <li>• Surficial soil samples (0-2 inches)</li> <li>• Analyses for DDTR, TOC, and percent moisture</li> <li>• Coordinates of sample locations</li> </ul>	Approximately 400 ft by 600 ft area northwest of the Basin between the bluff and Round Pond encompassing locations with historically elevated DDTR concentrations	<ul style="list-style-type: none"> <li>• If concentrations are less than PRGs, no further action required.</li> <li>• If concentrations exceed PRGs, define extent. Response actions for the soils will be evaluated during remedial design.</li> </ul>
<u>Groundwater Upwelling in the Basin</u>			
Where and how much groundwater is upwelling in the Basin?	<ul style="list-style-type: none"> <li>• Measure groundwater levels in wells/piezometers during a flood and non-flood event.</li> <li>• Measure corresponding Basin water elevation at gate during groundwater level measurement</li> <li>• Look for seeps along bluff line; if located, provide GPS coordinate(s)</li> <li>• Collect relatively undisturbed cores of dense clay for permeability testing (approximately 6 locations)<sup>1</sup></li> </ul>	Basin	<ul style="list-style-type: none"> <li>• Use data for cap design and material selection.</li> </ul>

DATA QUALITY OBJECTIVES  
SUPPLEMENTAL SAMPLING  
Olin McIntosh OU-2  
AMEC Project 6107-12-0036  
Meeting Dates: January 17-18, 2012

Decision/Question: Reduction of Uncertainty for the Feasibility Study/Remedial Design. Is Remedial Action Required?			
Subordinate Questions	Data Inputs	Boundaries	Decision Rule
Kd Values of Basin Sediments and Cap Materials			
Is the Kd value used in cap design representative of Basin/Round Pond sediments?	<ul style="list-style-type: none"><li>• Repeat Battelle study to evaluate Kd values for various Basin sediment samples</li><li>• Evaluate chemical flux to understand prior to placing cap to assist with cap design</li></ul>	Basin/Round Pond	<ul style="list-style-type: none"><li>• Kd values will be compared with literature values. The Kd values should be reasonably consistent with literature. Justification will be provided if the Kd values are not reasonably consistent with literature.</li></ul>
What are the Kd values for various cap materials to be evaluated for remedial design?	<ul style="list-style-type: none"><li>• Kd studies for various cap materials</li><li>• Potential cap materials: borrow soils from the bluff, local quarry material, USACE dredge spoils</li><li>• Potential amendments for evaluation: Aquagate, apatite, microporous alumina silicate</li><li>• Toxicity tests for cap materials</li></ul>	Basin/Round Pond	<ul style="list-style-type: none"><li>• Kd values will be compared with literature values. The Kd values should be reasonably consistent with literature. Justification will be provided if the Kd values are not reasonably consistent with literature.</li><li>• If the cap materials demonstrate toxicity, do not use for capping.</li><li>• If the cap materials do not demonstrate toxicity, evaluate for capping</li></ul>

Footnote:

<sup>1</sup> Meet with USEPA to discuss availability and applicability of other groundwater flux measurement technologies to OU-2.

Prepared by/Date: HEF 2/22/12  
Checked by/Date: CED 2/24/12